

## Leaching Properties of Biocides in the Pantanal Basin

Laabs, V.<sup>1</sup>, Amelung, W.<sup>1</sup>, Pinto, A.<sup>2</sup> and Zech, W.<sup>1</sup>

<sup>1</sup> Institut für Bodenkunde und Bodengeographie, Universität Bayreuth.

<sup>2</sup> Projeto Ecologia do Gran Pantanal 2, Universidade Federal de Mato Grosso.

To assess the contamination potential of widely spread used soybean and corn pesticides (alachlor, atrazine, chlorpyrifos, l-cyhalothrin, deltamethrin, endosulfan a, metolachlor, monocrotofos, simazine, trifluralin) for ground and surface water bodies, field and laboratory experiments regarding their leaching behaviors on two typical Cerrado soils of Mato Grosso (Haplustoxs – Latossolo vermelho-amarelo, Psammments – Areia Quartzosa) were conducted.

Until 80d after application of pesticides only low leaching rates were observed on both soils under study in a field lysimeter experiment. The highest leaching rates were measured for the herbicides metolachlor, alachlor, simazine, atrazine and trifluraline (0.003-0.2 % of applied amount in 35 cm soil depth, 0.0002-0.0028 % of applied amount in 95 cm soil depth). The insecticides did not leach in significant amounts into the subsoil

(< 0.02 % of applied amount in 35 cm soil depth, no concentrations detected in soil water at 95 cm soil depth). The polar herbicides metolachlor and alachlor were detected since 66d after application in rising concentrations (0.4 – 47 µg/L) in the soil water of the sandy soil (35 cm depth), which was attributed to progressive chromatographic transport within the soil profile. The laboratory soil

sorption coefficients ( $K_d$ ) measured were for most compounds about two-fold larger in the Haplustoxs (0.91 – 204 mL g<sup>-1</sup>) than in the Psammments (0.22 – 122 mL g<sup>-1</sup>). Therefore, the mostly similar amounts of pesticides leached in sandy and clayey soil could be explained with stronger preferential flow of water in the Oxisol, which compensates for the higher sorption capacity of the clayey soil in comparison to the sandy soil. The results suggest that the low leaching tendency of biocides in our field experiment was influenced by the relatively dry weather conditions and the fast dissipation of pesticides in soils under tropical climate ( $t_{1/2}$  ca. 1 - 20d). Nevertheless leaching of pesticides at the end of the 80d experiment could be observed - especially in the sandy soil.

Further studies are needed to characterize pesticide dissipation in subsoil and aquifer material of tropical regions to assess the contamination potential of pesticides already leached beyond the root zone of soils. Detailed monitoring studies on pesticide concentrations in streams, lakes and groundwater have to clarify, if pesticide contamination of water bodies is only caused by surface run-off input, or if long-term biocide leaching from agricultural soils to the groundwater may be of concern in this respect.

## Nitrogen Management for Perennial Crops in Amazonia

Schroth, G.,<sup>1</sup> D'Angelo, S. A.<sup>2</sup> and Rodrigues, M. R. L.<sup>2</sup>

<sup>1</sup> Universität Hamburg, Hamburg, Germany

<sup>2</sup> Embrapa Amazônia Ocidental, Manaus, Brazil

Nitrogen is a growth-limiting nutrient in many forest and agricultural ecosystems in temperate and tropical climates. It has always played a prominent role in tropical agroforestry and land use research, because through the inclusion of legume trees, leguminous cover crops and food and fodder legumes, a substantial contribution can be made to the nitrogen requirements of land use systems. In fact, biological nitrogen fixation makes nitrogen the only truly renewable nutrient and the only nutrient whose exports with harvest products need not necessarily be compensated by external additions for sustainable land use without mining of soil reserves. However, on many or most sites a

supplement of mineral nitrogen fertilizer is necessary to obtain maximum yields.

The oxisols of central Amazonia are extremely poor in almost all nutrients, but are relatively well supplied with nitrogen. Several perennial crops did not respond to applications of mineral nitrogen with increased yields. Furthermore, subsoil accumulations of nitrate, indicative of leaching of excess nitrogen, seem to be common under agricultural systems with and without nitrogen fertilization and have even been observed under primary forest. The nitrogen-sufficiency of perennial crops on these soils is apparently related to the rather large mineralization rates of

soil nitrogen, which have been measured both under forest and under agricultural vegetation. In tree crop agriculture and agroforestry, nitrogen cycling can be further increased through the inclusion of leguminous cover crops. Under a *Pueraria* cover crop, significantly increased rates of nitrogen mineralization and nitrogen concentrations in the soil solution indicated a pool of readily available nitrogen for perennial crops - within the limits of their root systems. This latter condition is critical, as the spatial separation of nitrogen supply and demand caused by excessive spacing of tree crops and limited lateral development of their root

systems may lead to leaching losses of nitrate from the soil in the interspaces between the trees. Optimum tree spacing, inclusion of semiperennial crops in the inter-tree spaces during the initial development of the trees, and encouragement of the lateral root development of the trees through appropriate management measures can reduce unproductive nitrogen losses and improve the nitrogen supply of the trees. If such measures are taken, a productive tree crop agriculture on central Amazonian oxisols does probably not depend on external nitrogen inputs.

### **Abundance, Biomass and Diversity of the Soil Fauna in Degraded Areas under Recuperation in the Central Amazon Region**

**Garcia, M.<sup>1</sup>, Beck, L.<sup>2</sup>, Förster, B.<sup>3</sup>, Franklin, E.<sup>4</sup>, Hanagarth, W.<sup>2</sup>, Höfer, H.<sup>2</sup>, Luizão, F.<sup>4</sup>, Luizão, R.<sup>4</sup>, Martius, C.<sup>5</sup>, Morais, J. W.<sup>4</sup> and Römcke, J.<sup>3</sup>**

<sup>1</sup> Embrapa Amazônia Ocidental, Brazil

<sup>2</sup> Staatliches Museum für Naturkunde Karlsruhe, Germany

<sup>3</sup> ECT Oekotoxikologie GmbH

<sup>4</sup> Instituto Nacional de Pesquisas da Amazônia, Brazil

<sup>5</sup> Center for Development Research – ZEF, Germany

The soil fauna plays an important role in the stability of decomposition processes and as a result its abundance, biomass and species composition, may influence the nutrient cycles in agroecosystems. Therefore abundance, functional group - composition and biomass of the these organisms were studied in plots of polyculture forestry systems and in plots of nearby secondary and primary forest. Evaluation of macrofauna from Berlese samples shows a substitution of several faunal groups in the

anthropogenic systems when compared with primary forest. In primary forest social soil insects (ants, termites) and earthworms appeared with larger individual numbers, whereas in the polycultures, other decomposer groups like isopods and diplopods had higher abundances. Roughly the same trends are confirmed by biomass calculations, although some groups (e.g. ants, diplopods) behave quite differently in biomass than in abundances.